CBM 8010

IEEE 488 COMPATIBLE

MODEM

OPERATOR'S MANUAL

commodore

901 California Avenue, Palo Alto, CA 94306 • (415) 326-4000 • Telex 345-569 • Cable COM BUS MAC PLA

CBM 8010 MODEM MANUAL

INTRODUCTION

We sincerely appreciate your selection of Commodore's acoustically coupled originate and answer IEEE 488 compatible 8010 modem. The CBM 8010 is compatible with the Bell 103 and 113 modems for use in the United States and with V.21 specifications for use in CCITT countries. In addition to being compatible with the IEEE 488 interface, it also conforms to the International Electro-technical Committee (IEC) specifications for programmable instrumentation.

INSPECTION AND INSTALLATION

Your new CBM 8010 was originally shipped in a carefully designed container. When you remove the unit, inspect the exterior carefully for any signs of shipping damage. We recommend that shipping materials be retained for inspection by the shipping carrier in case of shipping damage, or for reshipment should return to Commodore be necessary.

If there is no apparent shipping damage, make sure the power is off and connect the AC adaptor to the CBM 8010 and to a source of AC power (115 V AC - US, 230 V AC - CCITT). Connect the IEEE 488 compatible connector to the 24-pin connector on the back of the modem.

SWITCHES

OR.OFF.AN The 8010 is designed to function as either an ORiginating or ANswering acoustically coupled modem. For teleprocessing applications when the originate mode is desired, the OR.OFF.AN switch should be switched to the OR position.

For terminal-to-terminal communications when the answer mode is desired, the OR.OFF.AN switch should be switched to the AN position.

To turn the 8010's power off, the OR.OFF.AN switch should be switched to the OFF position.

FD.TST.HD The CBM 8010 may be operated in either the Full Duplex or Half Duplex mode. When the half duplex mode is desired (e.g., for self testing the system), the FD.TST.HD switch should be switched to the HD position. The half duplex mode allows computer/terminal data to be transmitted at the same time that data is echoed back through the interface for display by the local terminal. This mode is generally not required on 488 compatible terminals and computers, but the feature is available for both diagnostic testing as well as local copy presentation, should it be desired.

In the normal mode of operation, full duplex is selected and the FD.TST.HD switch should be switched to the FD position. The full duplex mode allows data to be transmitted simultaneously with the receipt of data from the remote modem.

To activate the self-test mode to verify that the coupler and terminal are functioning properly, the FD.TST.HD switch should be switched to the TST position (see "TROUBLESHOOTING").

INDICATORS

TST TST indicates that the CBM 8010 is operating in the self-test mode.

CRX CRX indicates that the carrier from the remote modem has been received and the CBM 8010 is ready for teleprocessing.

RCV RCV indicates that data is being received. RCV is on during the receipt of a SPACE signal and extinguishes upon the receipt of a MARK or when no carrier is being received.

XMT The XMT indicator serves a dual purpose in the CBM 8010 modem. During the time that the modem is off line, the XMT light is illuminated indicating that the power is on to the modem. As soon as the modem is activated on line and the CRX light is illuminated, the XMT indicator turns off and then follows the MARK/SPACE condition in the normal convention. That is, the XMT light is on during a SPACE condition of the local terminal and is off when a MARK is being transmitted.

OPERATION

A data communications link requires that one station transmit and receive in the originate mode and the other receive and transmit in the answer mode. If both stations are in the same mode, a data communications link cannot be established (see SPECIFICATIONS for precise transmit and receive frequencies).

When communicating with a time-share computer, the CBM 8010 should be in the originate mode as the modem at the computer end will be in the answer mode. When communicating with another terminal, agreement on the mode of operation is made prior to data exchange.

ORIGINATE MODE

1. Ensure that the terminal power is on and is ready for remote operation.

2. Switch the CBM 8010 to the ORiginate mode. The XMT indicator will turn on indicating power is on.

3. The CBM 8010 should be switched to the Full Duplex mode for most normal communications. However, in the event that your computer/terminal is programmed so that it does not display characters locally as they are typed, the Half Duplex mode allows characters to be echoed back through the

interface for processing and displayed as received characters. This is useful to assure that data is accurately processed through the interface.

4. Determine that the remote modem is operating in the ANswer mode. If it is not, switch the 8010 to the ANswer mode and proceed with instructions under "ANSWER MODE."

5. Dial the remote number and wait for a high pitched tone.

6. After hearing the answering tone, place handset firmly in the acoustic cups with the handset cord lying over the word "CORD" on the rear cup. When the XMT indicator goes out and the CRX indicator turns on, the CBM 8010 is ready for communication.

7. Sign on and proceed with terminal operations.

NOTE: Although the 8010 contains circuitry that minimizes the effects of a noisy telephone connection, severe line noise may cause transmission problems. If errors appear, repeat the dial-up procedure to obtain a better connection.

ANSWER MODE

1. Answer the telephone manually.

2. Ensure that the terminal power is on and is ready for remote operation.

3. Switch the 8010 to the ANswer mode. The coupler will produce a high pitched tone allowing the originating modem at the remote end to accomplish the handshake necessary for terminal-to-terminal or terminal-to-CPU communications. The XMT indicator is illuminated showing that power is on.

4. Place the handset firmly into the acoustic cups with the handset cord lying over the word "CORD" on the rear cup. When the CRX indicator turns on, the XMT indicator goes off and the "handshake" is complete. The CBM 8010 is ready for communication.

5. Sign on and proceed with data exchange.

TERMINATING A CALL

1. Type a sign-off command.

2. Switch the power off and remove the handset .

NOTE: When the power is turned off in the CBM 8010, the special interface used in the modem will not interfere with normal operation on the 488 bus.

THE CBM 8010/PET OPERATION

This is a functional description of the CBM 8010 modem. This modem can be connected to computers that utilize the fully implemented IEEE 488 interface. The interface is compatible with the IEC bus system defined in detail by IEC document 66CO22. This interface bus is an international standard with a stringently designed set of interface lines and termination requirements.

The IEEE 488 interface in the 8010 modem complies with this international specification including all of the terminations of control and data signals. In addition, the modem has the standard 45 milliamp drive capability required in the standard.

The preselected address of the CBM 8010 is factory set at "5". If it is necessary to change the address, a user may do so by opening the modem enclosure and changing the internal jumpers as shown in Figure 1. The address is binary weighted with A1 having a value of "1" and A5 a value of "16". This allows the user to program any of the thirty-one possible addresses for the device. This IEEE address is the same for both the TALKER and the LISTENER functions of the modem.

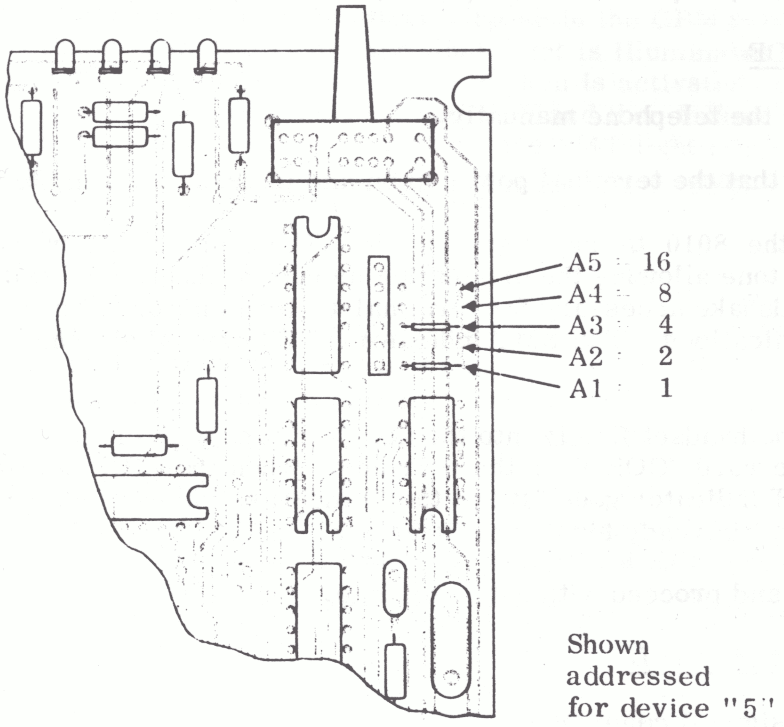

Figure 1. Location on Board and Weighted Value of Address Bits

Programming the computer to work with the modem is straightforward. All that is necessary is to address the modem as a TALKER and if a character has been received through the acoustic coupler and decoded in the custom interface, it will be presented in parallel to the IEEE bus. An example of this operation is shown in Figure 2.

```
10 OPEN4,5
20 GET#4,A$:IFST<>0THEN GOTO20
30
```

Figure 2. Sample of Program to Input Data from the CBM 8010

This programming example shows how a modem may be accessed from the PET to read an input character. The short program shown operates as follows:

Statement 10 opens a file numbered 4 in the PET computer. This file is further defined in that it is going to talk to a device addressed number 5. This is all that is required to notify the PET that an IEEE device exists on the bus and its address is 5.

Included in statement 20 is a read statement to file #4. The GET command in the PET will try to read a character from the IEEE device specified in the open statement. As a result the TALK address is sent to the modem and if a character has been received the character will be returned as the variable A$. However, if there was no character available (i.e., had not been received into the modem) the modem will not answer or complete the handshake. This will allow the Commodore PET to time out, providing a non-zero PET status (ST). The second half of statement 20 is a test to see if the status is a 0 indicating a character has been received. Therefore, in this statement, if the status ST is not equal to 0, then the program will return to statement 20 and issue another read statement. The result is that the program will hang on this statement until a valid character has been received. After a character has been received, the program will execute the subsequent statements.

Note that in order to avoid the hang condition, the PET should be checked for a time out if no character was available. The INPUT command may also be used to read the input. However, some format conditions must be adhered to.*

There are other ways to indicate that a character has been received in the modem but probably the best way is by the use of the service request line as specified in the IEEE 488 specification. The SRQ line will be asserted calling for a service request from the PET controller when a character has been received. The sequence of operation is as follows:

When a valid character has been received by the modem, a service request is asserted by the CBM 8010 interface. The PET controller then recognizes the request and in turn issues a polling sequence called serial poll. When the polling controller addresses the modem (device 5 in this case), the modem will return a status word as

* A further definition of the IEEE functions or the interface design may be found in the book, "The PET and the IEEE 488 (GPIB)" published by Osborne-McGraw Hill.

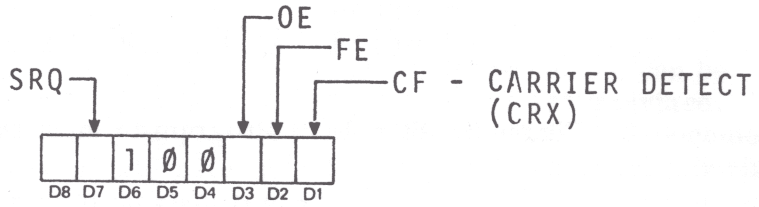

Figure 3. Format for the Service Request Control Character

shown in Figure 3. This status word indicates the status of the modem at the time of the serial poll. In particular, bit D7, as called out in the IEEE 488 specification indicates that this was the device requesting service (RQS). Therefore, this bit will be a 1 if the modem was the device requesting the service from the IEEE bus.

In addition, the actual modem status is also returned to the controller with bit D1 indicating the CF function of the modem; bit D2 advises that an improper ASCII character was received indicating either a BREAK function or receipt of an invalid character; and bit D3 indicates an overflow has occurred and that either the PET has taken longer than the allowed 33.3 milliseconds to process a character or the sending device is transmitting at a character rate in excess of 30 characters per second. These diagnostic bits should be useful for control as well as indicating errors in operation. This status character is available at any time that the service request (SRQ) has been raised and a character is available for input to the PET.

```
1Ø OPEN4,5
2Ø PRINT#4,"NOW IS THE TIME"
```

Figure 4. Sample of Program to Output Data to the CBM 8010

Outputting to the modem is equally straightforward via the IEEE bus. In general, the program shown in Figure 4 can be used to transmit data through the modem. The open statement in line 10 specifies that file 4 will be TALKING to device 5. Statement 20 outputs the data, defined by the quotation marks, through file 4, thus causing the message to be transmitted by the modem. The sequence of operation is that the PET will send a LISTEN address to the CBM 8010 modem immediately followed by the ASCII characters NOW IS THE TIME as defined by the quotation marks. The operation will then be terminated with a carriage return, line feed.*

The transmit and the receive sections of the modem are double buffered allowing two complete character times for the computer to respond to either an input or the output of a character. Thus, it is possible for most IEEE 488 compatible controllers to operate through the modem at a rate of 30 characters per second

* A further definition of the IEEE functions or the interface design may be found in the book, "The PET and the IEEE 488 (GPIB)" published by Osborne-McGraw Hill.

(or 300 baud) using BASIC language instructions with the programs previously shown. If it is not possible to dedicate the controller to inputting from the modem, it is recommended that the service request (SRQ) function be implemented using an assembly or machine language subroutine.

APPLICATIONS

For PET-to-PET telecommunications, the user may use the following program:

```
1 D=5
2 OPEND,D
3 PRINT" CONTROL CHARS ARE SHIFT"
10 Z$=CHR$(0):C$=CHR$(13)
100 GET#D,A$:IFSTTHEN130
110 A=ASC(A$+Z$)AND127:IFA>96THENA=AAND223
120 PRINT"■"CHR$(A)"■";
125 IFA$=C$THENPRINT">";
130 B=FRE(0):REM GARBAGE COLLECT PROTECT
140 GETA$:IFA$=""THEN100
150 A=ASC(A$):IFA>127THENA=AAND31
155 PRINTA$;
156 IFA$=C$THENPRINT"■>■";
160 PRINT#D,CHR$(A);
170 GOTO 100
180 END
```

For use with ASCII compatible systems such as The Source or Micronet, the following program may be used:

```
100 PRINT"♥■ PET-CBM 8010 TERMINAL"
110 PRINT
120 OPEN4,5
130 GETA$:IFA$=""GOTO210
140 IF ASC(A$)=13GOTO180
150 PRINTA$;
160 PRINT#4,A$;
170 GOTO130
180 PRINT#4,""
190 PRINT""
200 GOTO130
210 GET#4,A$:IF ST<>0 THEN GOTO130
240 PRINT#4,A$;
250 IFASC(A$)<172 GOTO290
260 IF ASC(A$)>244 GOTO290
270 PRINT CHR$(ASC(A$)-128);
280 GOTO210
290 PRINTA$;
300 GOTO210
310 END
```

TROUBLESHOOTING

If communication cannot be established or transmission is garbled, the following tests will help to determine at what point the malfunction is occurring.

TEST #1

1. Switch the CBM 8010 to the Half Duplex mode and use the following test program to verify that the interface to the PET from the CBM 8010 is functioning properly.

```
5 REM LDS-B
11Ø OPEN4,5
115 GET#4,A$
12Ø PRINT"♥"
13Ø FORI=1TO255
14Ø PRINT"S"I
15Ø PRINT#4,CHR$(I);
16Ø GET#4,A$
17Ø IFST=2THEN PRINT"♥TIMEOUT ERROR CHECK DEVICE ADDRESS"
18Ø IFASC(A$)<>ITHEN PRINT"ERROR NUMBER IS ",I:CLR:GOTO11Ø
19Ø NEXTI
2ØØ PRINT "♥RQQQQTEST COMPLETE:
21Ø GOTO13Ø
```

2. Type RUN, carriage return, on the PET keyboard and note that the PET video display unit will show an increasing digit from 1 to 255 following which it will display TEST COMPLETE. If this test performs satisfactorily, the basic interface electronics and control electronics in the CBM 8010 are working properly with the PET.

TEST #2

3. Switch the CBM 8010 to the TST position on the HD.TST.FD switch and the OR position of the OR.OFF.AN switch to the ORiginate position. If the coupler does not produce a high pitched tone, the coupler is defective; if a tone is present, proceed with TEST #3.

TEST #3

4. Obtain a telephone line free from any noise. Dialing a single digit on the telephone will obtain a quiet line for about thirty seconds. If a longer period of time is necessary, dial a telephone number that can be controlled and cover the remote mouthpiece to eliminate any noise.

5. Place the handset firmly in the acoustic cups with the handset cord lying over the word "CORD" on the rear cup.

6. When the CRX indicator turns on, reinitiate the test program entered earlier. Type RUN, carriage return, and verify that the modem is operating the same as it had previously operated in the Half Duplex (local)

mode. If the data is garbled, the acoustic coupling portion of the modem is possibly inoperative. If the test is correct and the number 255 is reached and TEST COMPLETE is indicated, skip to TEST #4.

7. If the message is garbled or if the CRX indicator did not come on when the handset was placed in the cups, the carbon granules in the mouthpiece microphone may be compacted. This problem is likely to occur if transmission has been underway for several hours without the presence of a modulated carrier.

8. Tap the handset sharply with your hand or a book. If the carbon granules are simply compacted, this will unpack them and allow normal operation.

9. Repeat TEST #3. If the message is accurate, proceed with TEST #4. If the message is garbled or if the CRX indicator did not come on when the handset was placed in the cups, repeat TEST #3 with a different handset or phone. (Carbon microphones can become defective with age.) If the message is still garbled or if the CRX indicator again did not come on, the coupler is probably defective.

TEST #4

10. Leaving the handset in the acoustic cups, switch the 8010 to the OFF position for approximately five seconds, and then to the ANswer mode.

11. When the CRX indicator turns on, reinitiate the test program by typing RUN, carriage return. The counter will once again be displayed on the screen and TEST COMPLETE will be reached. If the message is not accurate, the coupler is defective. If the message is accurate, the problem probably lies in the remote modem, the remote terminal or computer, or your communication protocol is improper.

NOTE: Because the CBM 8010 modem is designed to operate at 300 bits per second (30 characters per second), it is possible that the user developed program operating in the PET computer may not be capable of processing data received at a rate of 30 characters per second. When operating with The Source, Micronet, or other timesharing facilities, it is often the case that data is transmitted from these sources at 30 characters per second. Should you find that you are dropping characters or missing entire messages, you should consider examining your program to verify that it will, in fact, process a character within 33.3 milliseconds or less, in order to receive subsequent characters. The CBM 8010 is equipped with a two character buffer so that the user may choose to process more than one character should it be available at the interface.

PIN CONNECTIONS

Amp 552791-1 Pin #	Signal Line	Signal Definition
1	DIO1	Parallel Data Bit 1
2	DIO2	Parallel Data Bit 2
3	DIO3	Parallel Data Bit 3
4	DIO4	Parallel Data Bit 4
5	EOI	End of Output/Identify
6	DAV	Data Available
7	NRFD	Not Ready for Data
8	NDAC	Not Data Accepted
9	IFC	Interface Clear
10	SRQ	Service Requested
11	ATN	Attention
12	Frame Ground	
13	DIO5	Parallel Data Bit 5
14	DIO6	Parallel Data Bit 6
15	DIO7	Parallel Data Bit 7
16	DIO8	Parallel Data Bit 8
17	REN	Remote Enable
18,19,20 21,22,23 24	Shield Ground	

SPECIFICATIONS/IEEE

The CBM 8010 modem conforms to the IEEE 488-1978 specification. This specification is a standard accepted by the IEEE and IEC for programmable instrumentation. The functions supplied or supported by this modem are:

AH1 (Acceptor Handshake)
SH1 (Sender Handshake)
T1 (Talker)
L1 (Listener)
SR1 (Service Request)

Service request (SRQ) is supported allowing interrogation by a serial poll from the IEEE 488 controller in the system. An SRQ is initiated by a character received in the modem. The serial poll conforms to the IEEE subcommittee protocol proposal. The serial poll status returned contains the following information: carrier detect, overrun error (for baud rate errors) and framing error (for break indication). This modem is intended for 300 baud or 30 character per second operation only.

brought to you by
andy finkel